PATENT

AF/3613

#13

9/12/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Docket No.: PFLUG

In re PATENT Application of:	)
	)
RAINER PFLUG et al.	) **Examiner: Sy, Mariano Ong**
	)
Appl. No.: 09/754,618	) **Group Art Unit: 3613**
	)
Filed: January 4, 2001	)
	)
For: THRUST BALL BEARING	)

BRIEF OF APPEAL

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231, on **September 2, 2003.**
(Date)

URSULA B. DAY
(Name of Registered Representative)

(Signature)

Sept 2 2003
(Date of Signature)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

S I R:

This is an appeal from the final rejection of claims 1-11 by the Primary Examiner. The Brief is being filed under the provisions of 37 C.F.R. 1.192. A check in the amount of $320.00 to cover the requisite fee set forth in §1.17(f) is attached.

To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. The Commissioner is hereby authorized to charge fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment to Deposit Account No. 06-0502.

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(1) REAL PARTY IN INTEREST

The above-referenced patent application was assigned to INA WALZLAGER SCHAEFFLER OHG and ownership of all right title and interest rests with INA WALZLAGER SCHAEFFLER OHG.

(2) RELATED APPEALS AND INTERFERENCES

No related appeals and interferences are pending.

(3) STATUS OF CLAIMS

The following claims are on appeal:

Claims 1-3 and 6-9 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,921,684 (Niina) in view of U.S. Patent No. 6,203,634 (Volkmuth) and "Technical Book: 'Ball and Roller bearings'; publisher: John Wiley & Sons, 3rd Edition, pp.38-41" (Technical Book).

Claims 4, 5, 10 and 11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Niina in view of Volkmuth and Technical Book, and further in view of U.S. Pat. No. 6,062,736 (hereinafter "Zernickel").

(4) STATUS OF AMENDMENTS

No amendment has been filed under 37 C.F.R. 1.116 after issuance of the final rejection.

(5) SUMMARY OF INVENTION

The present invention refers to a thrust ball bearing, specifically of a type including circular ring shaped bearing disks with bearing balls seated there between which roll on corresponding circular tracks. (see page 1, ¶ [0003]). The invention also relates to a scroll compressor with a first bearing disk connected to a revolving scroll member and a second bearing disk received in a housing so that the compressor space with variable volume for transport of a medium is formed during interaction of the revolving second scroll member secured to the housing and a generated thrust is absorbed by the revolving scroll members via the bearing balls (see page 5/6 ¶ [0013]). Races in conventional bearing disks from carburized material exhibit poor wear behavior when subjected to high loads and fail when the bearing disks are subjected to unavoidable overload spikes. In accordance with the present invention, the bearing disks are fashioned from through-hardenable ferrous material. In accordance with a further aspect of the invention, the disks are from unalloyed, low alloy or high alloy ferrous material, where steel is designated unalloyed if containing less that 0.5% of SI, 0.8% of Mn, 0.1% of Al or Ti, 0.25 % of Cu, while steels that are highly alloyed have more

than 5% of alloy components. The steels used in the present invention are of the type C45, C 55, Ck, 67, C 75, 100 Cr 6 or Mn 3 and have a martensitic structure. Relatively low quenching speeds support transformation to martensitic structure and thus adjusting hardness of the work piece core.

(6) ISSUES

Issue 1-Whether claims 1-3 and 6-9 are patentable under 35 U.S.C. §103 over Niina in view of Volkmuth, and Technical Book?

Issue 2-Whether claims 4, 5, 10 and 11 are patentable under 35 U.S.C. §103 over Niina in view of Volkmuth and Technical Book and further in view of Zernickel?

(7) GROUPING OF CLAIMS

For each ground of rejection which Appellants contests herein which applies to more than one claim, such additional claims, to the extent separately identified and argued below, do not stand or fall together.

(8) ARGUMENT

Issue 1-Whether claims 1-3 and 6-9 are patentable under 35 U.S.C. §103 over Niina in view of Volkmuth, and Technical Book?

As stated above in the summary section and in the specification of the subject application, the present invention has as stated objects an improved thrust ball bearing and in particular also improved thrust ball bearings for scroll compressors. According to the present invention, an improved bearing disk for a scroll compressor is from through-hardenable ferrous material.

In a scroll compressor, thrust ball bearings are interposed between two members who effect an eccentric rotary movement. The thrust ball members facilitate ease of motion thereby preventing the revolving scroll member from rotating on its own axis and thus supporting the thrust load. Raceways in bearing rings accommodate the thrust ball bearing between the stationary scroll member and the revolving scroll member.

Niina refers to heat treatment hardening depth of raceways in connection with bearing rings in a scroll compressor. Niina relates to a thrust ball bearing wherein the heat treatment hardening of a bearing ring is prescribed such that, at any depth from the raceway surface, the value which is seven times the dynamic shearing stress τ_{zy} produced by the rolling element does not exceed the hardness at that depth. Heat treatment is affected by a hardened layer present at a depth not less than 4% of the diameter of the balls.

Niina refers to flaking as causing the expiration of the rolling contact life. Shown in Figs. 2 through 4 of Niina are graphs which illustrate the dynamic shearing stress that operate on the ball bearings of a certain diameter relative to a raceway surface. As shown in both Figs. 3 and 4. The respective rolling life is a function of the diameter of the ball bearing and the depth of heat treatment.

In accordance with the solution offered in Niina, careful computation is needed to establish that the ratio between expected shearing stress and hardness results in the desired performance of the bearing disks that have undergone heat treatment, such as carburization, to a predetermined depth of the bearing ring.

In the subject invention, an entirely different solution is contemplated in order to improve thrust bearing disks, particularly with respect to bearing disks for a scroll compressor. The improved bearing disk of the present invention is based on the realization that stress peaks will occur that were previously not taken into account when computing the factor seven ratios (as in Niina). As a result, at deeper depths of the raceway the shearing/hardness ratio no longer holds and flaking occurs nonetheless. Providing thrust bearings from through-hardenable ferrous material in scroll compressors eliminates the need for ratio computation, accommodates stress peaks and thereby reduces fatigue in the bearings.

Pertaining to claim 1, the Examiner has cited Niina as showing a thrust ball bearing comprising first and second bearing disks. Recognizing Niina's lack of disclosure that the first and second bearing disks are made from through-

hardenable ferrous material, the Examiner has combined Volkmuth with Niina as supplying the teaching of through-hardened rolling bearing components.

However, Niina nor Volkmuth disclose or address the use of through-hardenable steel for use in thrust bearing disks of a scroll compressor.

Volkmuth refers to a general method of heat-treating through-hardened bearing steel. In the last Official Action, the Examiner in particular refers to the passage in col. 5, line 65 to col. 6, line 1, where it is stated that "[*T*]*he method of the present invention is described in the context of through hardened rolling bearing components. These components include rings, rollers, balls, washers and generally all parts of a rolling bearing made of through hardened bearing steel.*". This passage merely refers to the existence of through-hardened steel components, and how, in the context of the Volkmuth reference, the quality of existent through-hardened components can be improved. However, Volkmuth does not disclose through-hardenable components of the type as in the present invention, nor does it point into the direction of using through-hardenable steel for use in thrust bearings for a scroll compressor.

Appellants do not dispute the existence of through-hardened steel components. However, appellants do not claim any such components. Appellants do claim thrust bearing disks for scroll compressors. Thus, the Volkmuth reference has no disclosure on the subject matter as set forth in claim 1. Volkmuth refers merely generally to a method of treating through-hardened components. Use of through-hardened steel has been generally known in the bearing industry since some time. However, the use of disks for scroll compressors from through-hardenable

material has not been disclosed. Since the races of scroll compressors have not been made with through-hardened material, there would be no reason to look at this reference and combine it with Niina with or without Technical Book. Volkmuth merely refers to a method of *improving* through-hardened components. The fact that individual elements of the present invention can be found in the prior art is not determinative as to the question of obviousness.

It is Appellants contention, that the Examiner failed to make a prima facie case of obviousness and failed to explain the motivation one with no knowledge of applicant's invention would have to combine the references in a manner suggested. Consequently a combination of Niina with Volkmuth does not bring claim 1 within the realm of the obvious. This was also recognized by the Examiner since the Examiner felt compelled to add yet another reference in an attempt to meat out the combination of the Niina and Volkmuth references. Yet, the Technical Book, i. e. the referred to portions of the reference, is not directed to either ball bearings or to bearing disks. The Technical Book publication merely refers to a method of through-hardening rolling bearing steels in the context of roller-type bearings. Nothing in this publication teaches or suggests a reference to provide races of a thrust ball bearing or scroll compressor of through-hardened ferrous material. Please note that antifriction bearings are distinguished i.e. according to the shape of the rolling elements, namely between ball bearings and roller bearings. Technical Book relates to roller bearings and is silent as far as ball bearings are concerned.

Page 38 of the Technical Book, which bears the heading "Through hardening rolling bearing steels", refers clearly to roller bearings. Disks are not mentioned. Reference is made in the 2d paragraph in the Technical Book on page 38 to "thrust needle rollers" only. Thrust ball bearing disks or scroll compressors are not addressed. Similar to Volkmuth, this reference refers generally to heat-treating certain metal grades for rolling contact components. Nothing refers to thrust ball bearings.

It should be noted that the Niina/ Volkmuth/Technical Book combination must fail since there is no thread of motivation to combine these references and no details as to such motivation was discussed by the Examiner.

Niina is concerned with heat treatment of thrust bearings only. Volkmuth refers to improvement of components made from through-hardenable steel. Technical Book provides information on roller bearings. There is thus no basis to combine Technical Book teaching based on roller bearings with Nina exclusively concerned with the behavior of ball bearings in raceways or Volkmuth directed to improved through hardenable components. As stated by the Federal Circuit in *In re Rouffet*, 47 USPQ2d, 1453, 1457 "Most, if not all, inventions are combinations and mostly of old element. Therefore, an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability

of the claimed invention. Such an approach would be an illogical and inappropriate process by which to determine patentability."

Accordingly, there must be some motivation to combine the references to create the case of obviousness, and a showing that a skilled artisan, confronted with the problems as the inventor, would select the elements from the cited prior art references.

It is well established that the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. *In re Gordon*, 733 F.2d at 902. Neither Niina, Volkmuth nor Technical Book mention nor suggest the specific desirability. It is applicant's contention that the Examiner relied upon hindsight to arrive at the determination of obviousness, by piecing together the teachings of the prior art so that the claimed invention is rendered obvious. *In re Gorman*, 933 F.2d 982.

It is therefore respectfully submitted that the rejection of claim 1 under 35 U.S.C. 103 should be reversed.

As for the rejection of the dependent claims 2, 3, 8 and 9, the Examiner conceded that Niina is silent with respect to the specific materials set forth in claims 2, 3, 8 and 9. The Examiner's premise that Technical Book teaches these in relation to the thrust ball bearing claimed in claim 1 must be traversed.

Appellants do not dispute that Technical Book discloses certain steel grades. It is however disputed that this disclosure leads to the claimed subject

matter. Moreover, through-hardenable ferrous materials were known in the general bearing industry since the last century.

With respect to claims 2, 3, 8 and 9, the Examiner correctly acknowledged that Niina does not disclose the subject matter of these claims. However, Technical Book likewise does not disclose the subject matter of claims 2, 3, 8, and 9, nor does Technical Book provide the teaching leading to the subject matter of claims 2, 3, 8 and 9. Claims 2 and 3 are directed to thrust ball bearing disks. Nowhere in the Technical Book is there reference to thrust ball bearings. Claims 8 and 9 are directed to a scroll compressor with certain properties. However, nowhere in Technical Book is reference made to a scroll compressor.

With respect to claim 6, the Examiner cites Niina as disclosing the elements as recited in claim 6. Appellants concede that Figure 5 in Niina discloses similar structures as described in the Niina specification relative to Fig. 5. However, Niina does not disclose the first and second bearing disks made from through-hardenable steel so that claim 6 which depends from claim distinguishes over the reference Niina in the same manner as claim 1.

With respect to claim 7, the Examiner admits that Niina fails to disclose first and second bearing disks made from through-hardenable ferrous material. However, claim 7 is foremost directed to a scroll compressor. Neither Volkmuth nor Technical Book refers to scroll compressors, nor do they refer to thrust ball bearings.

It is therefore respectfully submitted that the rejection of the dependent claims 2, 3, 8 and 9 under 35 U.S.C. §103 should also be reversed.

Issue 2-Whether Claims 4, 5, 10 and 11 Are Patentable Under 35 U.S.C. §103 Over Niina In View Of Volkmuth And Further In View Of Zernickel?

Claims 4, 5, 10 and 11 on appeal and respectively dependent from claim 1 and claim 7, are considered allowable by virtue of their dependencies. It should, however, be noted that these dependent claims are considered allowable on their own merits as they recite other features of the invention neither taught nor suggested by the applied references.

Claim 4 and 5, on appeal, are directed to a thrust ball bearing wherein the bearing disks are made by a non-cutting shaping process and respectively the process carried out at a shaping speed of $\leq$ 2m/min. The shaping process and the shaping speed are critical to the claimed invention due to the objects of achieving an improved hardness. A modification of Niina with Zernickel is misplaced. Zernickel is directed to an entirely different type of bearing, namely a pre-tensioned rolling bearing with elastically yielding raceways. Elastically yielding raceways are unsuitable for scroll compressors. The smoothness of the raceway as pointed out by the Examiner is not at issue here. Rather the raceway has to be suitable for the purpose of the desired bearing type and load.

Furthermore, Zermickel does not even refer to a non-cutting shaping process, but only to a non-chipping process. Therefore, the shaping process referred to has nothing to do with and is unsuitable for the thrust bearing structures as claimed in claim 4. Moreover, Zernickel is completely silent as to any shaping speed. Therefore, one would not look to Zernickel at all to find

guidance for the specific structural features of the subject thrust bearing according to claim 4.

Regarding the rejection of claims 10 and 11 are related. Claims 10 and 11 are directed to the shaping process and shaping speed thereof for the thrust bearings in the scroll compressor, so that the same arguments apply to these claims as applied to claims 4 and 5.

It is therefore respectfully submitted that the rejection of the claims 4, 5, 10, and 11 under 35 U.S.C. 103, should be reversed.

(9) CONCLUSION

Appellants have invented a thrust bearing for a scroll compressor from through-hardenable ferrous material. The prior art of record does neither teach nor suggest the essential features as defined in claims 1 and 7 of the present invention but merely shows devices which at some point may disclose an element of the present invention but not the novel and inventive combination. The question of obviousness is, however, not whether each element existed in the prior art, but whether the prior art made obvious the invention as a whole for which patentability is claimed. (In re Sernaker, 702 F.2d 989, 217 U.S.P.Q. 1, C.A.F.C. 1983).

When considering the arguments set forth by the Examiner in the final rejection, Appellants believes that the Examiner relied on hindsight in reaching his obviousness determination. As the C.A.F.C. stated in *W.L. Gore*, 721 F.2d at 1553, 220 U.S.P.Q. at 312-313 "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher". Thus, the use of hindsight reconstruction to pick and choose among isolated disclosures in the prior art to reject a claimed invention is ill-advised.

Therefore, the rejection of claims 1 and 7 on this prior art is not well taken. The comments made above are similarly applicable to all of the remaining claims because all of these depend from claim 1 respectively claim 7 and share all

features thereof. It is well settled that a dependent claim which depends on an allowable parent claim shares in the allowability and this is therefore true of the remaining claims in the application.

For the above stated reasons, it is respectfully submitted that the rejection of the claims 1-11 issued by the Examiner on the references should be reversed.

Respectfully submitted,

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(10) APPENDIX

1. A thrust ball bearing, comprising first and second circular ring shaped bearing disks arranged in spaced-apart disposition and moving eccentrically to one another; and bearing balls arranged between the first and second bearing disks for rolling along circular tracks defined by the first and second bearing disks, said first and second bearing disks made from a through-hardenable ferrous material.

2. The thrust ball bearing of claim 1, wherein the bearing disks are made of an unalloyed, low-alloy or high-alloy ferrous material.

3. The thrust ball bearing of claim 1, wherein the bearing disks are made of a steel selected from the group consisting of C 45, C 55, Ck 67, C75, 100 Cr 6 and 85 Mn 3.

4. The thrust ball bearing of claim 1, wherein the bearing disks are made by a non-cutting shaping process.

5. The thrust ball bearing of claim 4, wherein the shaping process is carried out at a shaping speed of $\leq$ 2 m/min.

6. The thrust ball bearing of claim 1 for use in a scroll compressor having a housing accommodating a revolving scroll member mounted on a crank pin of a shaft, a stationary scroll member secured in the housing, said first bearing disk connected with the revolving scroll member and said second bearing disk securely fixed to the housing, whereby a compressor space with variable volume for transport of a medium is formed during interaction of the revolving scroll member and the stationary scroll member, and a generated thrust is absorbed by the revolving scroll member via the bearing balls.

7. A scroll compressor, comprising:

- a housing;
- a stationary scroll member secured in the housing;
- a revolving scroll member accommodated in the housing and so driven as to revolve at an eccentricity relative to the stationary scroll member, thereby compressing a medium in a compression space defined between the scroll members; and
- a thrust ball bearing having a first bearing disk connected with the revolving scroll member, a second bearing disk securely fixed to the housing, and bearing balls arranged between the first and second bearing disks for rolling along circular tracks defined by the first and second bearing disks, said first and second bearing disks made from a through-hardenable ferrous material.

8. The scroll compressor of claim 7, wherein the bearing disks are made of an unalloyed, low-alloy or high-alloy ferrous material.

9. The scroll compressor of claim 7, wherein the bearing disks are made of a steel selected from the group consisting of C 45, C 55, Ck 67, C75, 100 Cr 6 and 85 Mn 3.

10. The scroll compressor of claim 7, wherein the bearing disks are made by a non-cutting shaping process.

11. The scroll compressor of claim 10, wherein the shaping process is carried out at a shaping speed of ≤ 2 m/min.